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Construction Management and Economics

ISSN: 0144-6193 (Print) 1466-433X (Online) Journal homepage: www.tandfonline.com/journals/rcme20

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**To cite this article:** David Boyd (2013) Using events to connect thinking and doing in knowledge management, Construction Management and Economics, 31:11, 1144-1159, DOI: 10.1080/01446193.2013.866260

**To link to this article:** https://doi.org/10.1080/01446193.2013.866260

*Construction Management and Economics*, 2013
Vol. 31, No. 11, 1144–1159, http://dx.doi.org/10.1080/01446193.2013.866260

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# Using events to connect thinking and doing in knowledge management

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Received 20 March 2013; accepted 12 November 2013

Knowledge management (KM) is disputed in concept and practice. This is related to the conventional objectivist view, where knowledge is independent, generic and passive, thus disconnecting thinking about practice from doing practice. A practice-based view is presented as being applicable to construction where practitioners compose action from past experience using intuition, situation awareness, analogical thinking and dialogue. Results from Knowledge Event Management demonstrate such composition in construction events. This view develops the KM proposition from being 'to think better about practice' to one of 'supporting people to act better in practice'. Such improvement is facilitated by learning from events in practice. Events are sensitive points of deep learning, critical to the recall of learning, and effective in the communication of learning within social contexts. Events are analogues for future practice of doing as ideas are for thinking. Improvement in practice requires changing analogues and using analogues more proficiently when composing practice. Organizational improvement then takes place through individuals working collectively both through seeing the consequences of action and from sharing narratives of events in a critical manner. Objectivist knowledge can be used as part of this critical challenge. This can be facilitated and encouraged by active management.

*Keywords:* Knowledge management, organizational behaviour, organizational learning, practice.

## Introduction

Work on improving construction takes many forms but most involve thinking about practice: that is, conceiving practice then using the conceptions as tools for changing construction practice. The connection between thinking and acting is seldom discussed and assumed to be automatic. One improvement approach which has been used in construction is knowledge management which isolates knowledge as the entity to work on and as such is clearly configured as a thinking activity. The idea that we are 'knowledge workers' (Drucker, 1999) has been a significant discourse within the fields of economics (Brinkley *et al.*, 2009), business (Sveiby, 1997), organizational behaviour (Senge, 1990) and education (World Bank, 2002). From this, managing knowledge is promoted as what most work now involves (Drucker, 1999) and also a way of improving ways of working (Davenport, 2005).

Conventional KM is dominated by what Hislop (2009) terms the objectivist view of knowledge and action. In this, the constitution of knowledge is undisputed and external to the users which means that knowledge is agreed and available for action and only requires discovery and refinement to make it better. This view promotes the collection, storage and 're-presentation' of knowledge in a de-contextualized way. This is an epistemological position centred on positivism and it is assumed to apply to all areas of knowledge. This knowledge so distilled can be used to engineer the world because of its completeness and accuracy set in rules that connect thinking and doing. Objectivists do not claim to know everything but consider that sufficient knowledge can be acquired through more diligent enquiry and correct distillation. In its de-contextualized and distilled form, knowledge can be conveniently stored in a computerized digital format and this has been one of the most promoted tools of KM. However, there still is a gap between this knowledge and its application which is labelled tacit knowledge. This is defined as what is not explicit knowledge. Objectivists assert that tacit knowledge

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can be reworked into explicit knowledge for example by the SECI (socialization, externalization, combination and internalization) cycle (Nonaka and Takeuchi, 1995). This objectivist view promotes knowledge management as the extraction of knowledge from people so that in its externalized form it can be controlled and used by anyone with productive and novel outcomes (Hislop, 2009).

Although the roots of this objectivist KM can be traced to Plato, it is the cognitivist stance of Simon (1969) and Cyert and March (1963) and their use of this in the analysis of the management of organizations that established the foundations of the subject and its concentration on thinking about practice. Cognitivism sees the brain as an information processor and these processes are activated as rules; the discovery of these rules provides the basis for objectivist KM. Many researchers of the 1950s and 1960s who were later to be leaders of the knowledge revolution had this perspective; Drucker (1999) and Argyris and Schon (1978) argued for the additional notions of the knowledge economy and organizational learning respectively giving the subject both a purpose and a mechanism. However, knowledge management only emerged as a term in the mid-1990s following the success of Senge's (1990) *The Fifth Discipline* and the practical drive of Sveiby (1997). Kakabadse *et al.* (2003) take a much more rounded view of knowledge management. Their taxonomy presents five approaches to knowledge management: (1) a philosophy model which is concerned with explaining what knowledge is and how we know; (2) a cognitive model based on the value of using and developing knowledge; (3) a network model concerned with the social environment in and surrounding organizations; (4) a community of practice model concerned with the social activity and sense of purpose; and (5) a quantum model which centres on knowledge availability from sophisticated computing and applications. They ask the important question about whether knowledge can be managed and make the significant deduction that 'the meaning of knowledge and KM practice can only be appreciated within a given context, social space and time' (p. 85). Thus, KM is itself problematic with critiques of the theory (Stacey, 2001) and criticisms of practices (Thompson *et al.*, 2001). Indeed, Easterby-Smith and Lyles (2005) presented knowledge management at a watershed identifying 'tacit knowledge' as the idea that underlies many scholars' arguments that this is required for KM to be applied in practice.

There has been substantial research into KM in construction through the work of Anumba, Egbu, Carrillo, Koch and Chen (e.g. Egbu, 2004; Koch, 2004; Anumba *et al.*, 2005; Carrillo, 2005; Chen and Mohamed, 2008). This has followed a similar path to general KM in that positions adopted are substantively objectivist but all see a problem of knowledge use yet do not pursue this as part of their work. Anumba takes the most absolutist objectivist position extending his theories to computer delivery systems (Al-Ghassani *et al.*, 2004; Anumba *et al.*, 2008). Egbu (2004) has a more rounded view which lists actions for overcoming barriers in technical, organizational and individual domains; these are practical but their efficacy for KM is not presented. Carrillo (2005) also has a broad view adding the dimension of lessons learnt but she also sees the accumulation of discrete knowledge as possible and useful in construction environments. None of these authors concentrates on the problem of application but they assume it is addressed by the conversion of tacit to explicit knowledge argument.

This paper will explore the problem of knowledge management for construction practice and its inadequacy in connecting thinking about practice and doing practice. Critiques of objectivist KM and its failure to deliver improvements are explored to demonstrate the disconnect between thinking and doing, and to identify the problem of content not being useful and form not being applicable to tasks. As part of this, the explicit–tacit separation is challenged. A practice-based view is presented which develops the KM proposition from being 'to think better about practice' to one of 'supporting people to work better in practice' leading to a need to study how people act in practice. This identifies that decision makers compose actions in situations rather than access them from a memory bank. The notions of situation awareness (Endsley, 1997), intuition (Klein, 2003), analogical thinking (Gentner *et al.*, 2001) and sensemaking (Weick, 2001) are drawn out as good descriptions of peoples' ways of working in practice. The particular, situated and contextual aspects of this are argued as critical for both doing and thinking about doing. Thus 'events', as humanly and physically situated occurrences, are suggested to be a fundamental aspect of knowledge management which can connect thinking and doing. The practical approach of Knowledge Event Management (KEM) (Boyd and Xiao, 2006), which originated in the construction industry, is presented and results from this are used to validate the compositional character of decisions in action by industry practitioners. Key then to a practical enactment of knowledge management and to improvement is the requirement to learn (that is to change individual awareness) so that situations are viewed differently and that more effective actions result. This learning takes place in the social setting of the event where dialogue (Shotter, 2010) and adaptive abduction (Bartel and Garud, 2005) of ideas are shown to be crucial. The individual and organizational aspects of this are analysed in order to set up conditions

that are effective for change. It is the way decision makers compose better solutions within a physical and social context that can deliver success. Learning in a social situation needs critical challenge which can be a role of management. This also suggests a possible repositioning of objectivist knowledge. Objectivist knowledge focuses on detail and so can provide a critical challenge to the view of events and enable learning. The paper concludes by discussing how this redefined notion of KM can operate in practice.

## Methodology

The approach described here is not just an interpretivist view versus a positivist view but one that sees practice itself as a way of knowing using differently constituted knowledge. Such a position is accommodated by a critical realist (Ackroyd and Fleetwood, 2000) perception of the world where sense-data accurately represent the physical world while explanations and actions within this are socially constructed and negotiable. Thus knowledge of practice is mediated by social construction and so difficult to determine accurately and with universally acceptable meaning (Mingers, 2008). All discussions of practice are inadequate, including this paper, but acknowledging this and placing the problems of practice more centrally allows a more relevant discussion. Improvement of practice is possible but this is socially determined. Literature around these ideas is discussed and used to critique conventional KM literature and identify key explanatory concepts for the study of practice. Previous practice research, KEM (Boyd and Xiao, 2006) has provided data to demonstrate these ideas. KEM identified the significance of events and used techniques that can be interpreted through the explanatory concepts. Thus, KEM is shown to be a practical approach to KM, explained by the ideas in this paper and a way of connecting thinking and doing. The discussion addresses the development of the approach in practice.

## Critical view of KM in literature

Most objectivist knowledge management has a logic which is undeniable, has examples which demonstrate success, and, in IT form, is universally adopted by senior management. This positive façade hides a problematic base exemplified by Wilson (2002) that KM is 'nonsense' as he exposes the contradictions of the subject in different journals:

> 'knowledge management' is an umbrella term for a variety of organizational activities, none of which are concerned with the management of knowledge. Those activities that are not concerned with the management of information are concerned with the management of work practices, in the expectation that changes in such areas as communication practice will enable information sharing. (Wilson, 2002)

There is much evidence that KM does not deliver knowledge that people need or in a form that is useful. In analysing failures in KM projects, Chua and Lam (2005) consider the features that contributed to this failure in five case studies. Like many authors (e.g. Storey and Barnett, 2000) they refer to Lucier and Torsilieri's (1997) statement that 84% of KM projects fail to have a real impact. They define what success would mean from Davenport and Prusak (1998) as growth in resources for KM, growth in usage, operation beyond the initiative and acknowledgement of the financial return. In Chua and Lam's (2005) analysis of failure they see four categories of factors: technology, culture, content and project management. As regards content, the main factor was 'irrelevant to their needs' and other issues such as obsolescence. Similarly Storey and Barnett (2000, p. 146) lament the 'overwhelmingly optimistic' presentation of KM. They see institutional commitment, organizational division, and inappropriate initiative management as key issues of failure that deliver a quantity of content but not what people need or delivered in a way that people can use. Storey and Barnett (2000) add that it is KM's lack of attention to fine-grained detail and its lack of attention to the meaning of abstracted propositions that must be attended to thus 'it needs to be seen to be useful to those … being asked to behave differently' (Storey and Barnett, 2000, p. 155). Griffiths (2011, p. 8) emphasizes the practical problem of KM use identifying 'a gap between the perceived value of knowledge, which is high, and the capability of KM processes being experienced by organisations'. He promotes a definition of KM which is about 'the management of resources that assist organisations in gaining competitive advantage'. Griffiths' (2011) new conception of KM is about producing better practice rather than more knowledge. It involves knowing what, how, why, who, when and who with. Griffiths (2011, p. 75) also raises the importance of context to content due to the 'situated variance brought about by the context of the organisation at any given time' limiting the usefulness of any content. This idea of context is fundamental to the ideas of Augier *et al.* (2001) who see the reductive and independent aspects of conventional KM as limiting social possibilities.

Conventional KM does acknowledge this disconnect between knowledge and using knowledge through invoking the notion of tacit knowledge as the

extra that makes it useful. Nonaka and Takeuchi (1995) present an explanation of how this tacit to explicit conversion can be addressed by their SECI cycle. Many authors find this fundamentally problematic. In many ways objectivist KM presents tacit knowledge as the deficit to explicit knowledge yet many authors see it as the primary knowledge (Polanyi, 1958; Tuomi, 1999; Tsoukas, 2005). Baumard (1999, p. 4) states 'there is an unavoidable paradox in attempting to study tacit knowledge by means of codification'. Even though Baumard's (1999) analysis is critical of the concept, he does accept tacit knowledge as a category. Tsoukas (2005) however, fundamentally attacks the conventional view through a return to Polanyi (1958); to him even the most theoretical knowledge can only be used in practice by the skill and judgement of people. Thus, Nonaka and Takeuchi's (1995) iconic example of conversion of tacit to explicit in breadmaking is fallacious to Tsoukas (2005) as they merely extracted the propositional and technical aspects, which Polanyi (1958) refers to as focal awareness, without accessing the subsidiary awareness of the whole activity. Tsoukas (2005) argues that subsidiary awareness, involving multiple sensory involvement with the task, can never be explicitly articulated as 'she would no longer be engaged in the same activity, namely kneading bread, but in the activity of thinking about bread kneading' (p. 772). Indeed, he further argues that reflection after the event merely extracts what can be articulated in language.

As with general KM, construction KM has started a more critical study of knowledge. Senaratne and Sexton (2008) distinguish between knowledge as an asset and knowledge as flow. The latter involves a much more organic, social and dynamic position of knowledge. Their insight however is to identify that there is little awareness of construction problem solving but they uncritically suggest that Nonaka and Takeuchi's (1995) SECI model is meaningful in developing practice. Li and Love (1998) also identify the lack of research into the mental capacities of problem solvers in construction and recognize the ill-structured nature of construction problems. In the end, they revert to objectivist artificial intelligence for the possibility of acquisition of experiential knowledge. Styhre and Gluch (2010) take a practical view of managing knowledge, identifying 'platforms' containing sets of past practice as metaphorical support for group decision making. This confirms other work by Styhre (2009) which presented a comprehensive sociological appreciation of the use of knowledge in the construction industry. All these studies have a bias towards cognitive activity, thus, all separate thinking about doing from doing, with subsequent problems of application.

In a profound way, Rooke *et al.* (2010) analyse the philosophical error of knowledge management in construction by exploring the tacit and explicit components of knowledge as defined by Polanyi (1958) and Ryle's (1949) distinction between 'knowing how' and 'knowing that'. Also, Rooke and Clarke (2012) acknowledge the significance of experiential knowledge and see this as part of a social conflict between manual workers and construction professionals. These authors are grasping the possibilities of alternatives to cognitive knowledge and emphasize the social nature of the use of knowledge. There are still cognitivist aspects to these authors' view of knowledge; however, their ethnomethodological conception suggests that research needs to work with the language and experience of practice. What people focus on depends on their context and actions.

Such critiques of conventional objectivist knowledge management, and a reduction in interest from practice in the possibilities of capturing intellectual capital in this manner, leave a space to redefine knowledge management and to reassess the possibilities of practice. However logical that objectivist KM is, it does not represent what happens in practice. This is made worse by KM's emphasis on thinking about practice. What appears to be lost in objectivist knowledge management is an explanation of how knowledge could help people at the point of use. Such knowledge needs to relate directly to the context; thus, moving from one context where knowledge is created to another where it is used requires an appreciation of use and context.

## Reconnecting knowledge to practice

What is required is research on how people work in practice so that any planned intervention which uses knowledge, works at the point of use. Studies of practice have only occurred relatively recently, although reference is often made to Aristotle's ideas of the five virtues of knowing *techné*, *epistéme*, *phronésis*, *sophia* and *nous* (Nicomachean Ethics, 1139b15) with phronesis being concerned with practical wisdom. Hislop (2009) acknowledges this when he makes practice-based knowledge his complement to objectivist knowledge. In making the reconnection, practice knowledge will be shown to be multivalent, contextual and compositional. To make use of this, theories of practice will be discussed and a set of explanatory concepts introduced that connect thinking and doing.

The practice turn in social theory (Schatzki *et al.*, 2001), although based on thinking about practice, offers many insights into new management practice (Whittington, 2006) as it focuses phenomenologically on what people do (Easterby-Smith and Lyles, 2005). Cook and Brown (1999) present practice as a distinct way of knowing as opposed to simply the utilization

of explicit and tacit knowledge. They also place practice knowing within a social setting which 'affords' an individual's ability to undertake a task. Thus the social situation defines what success and improvement mean. Blackler (1995) invokes a similar practice-based view when he categorizes knowledge into mediated, situated, provisional, pragmatic and contested forms. This move to practice being a fundamental way of knowing is taken up by MacIntosh *et al.* (2012) who suggest that there is a gap between academic discourse based on rigour, and practice activity based on relevance. They see value in knowing things in different ways such that developing a dialogical approach (Shotter, 2010) gives a practical activity for generating knowledge. As Cunliffe (2002, p. 36) states, with reference to Shotter (1993), dialogue 'involves constructing "practical theories" … ways of accounting for and shaping our experiences from within the experience itself'. Nicolini (2011) provides a rich intimate inquiry into practices where he determines 'where the knowing is'. This reveals how everyday life provides not just the context for actions but how these are conceived, communicated and evaluated. As Nicolini (2011, p. 617) summarizes 'The Heideggerian notion of site connotes knowledge as inherently situated in a system of ongoing activities; it describes knowledge as relational knowing, mediated by artefacts, and always rooted in a context of interaction'. Activities are set within organizational practices and locations, where these have been prescribed for these activities to take place, and mediated by objects and technologies. Practice is time constrained but also dependent on the social interactions of the particular group of people. This 'knowing in practice will constitute one of the sources of sociality' (Nicolini, 2011, p. 613) aligning with Wenger's (1998) notion of a community of practice.

In a much more pragmatic approach to practice, the concept of naturalistic decision making (NDM) of Klein (Klein, 1998; Lipshitz *et al.*, 2001) counters theoretical views and explanations of action as offered by classical decision making. NDM's approach is to study experts in the field and as such acknowledges the ill-structured nature of problems in dynamic and uncertain social and physical environments where the actors work in a time pressured position which does not allow extensive rational analysis. Klein's (1998) notion of practice, based on the philosophical work of Dreyfus *et al.* (1986), is that actors develop skills to act in such environments principally through experience. This work has many devotees in practice from across the domains (nursing, military, aviation, medical, engineering and fire fighting). The basis of the approach is descriptive and interpretative rather than predictive. It has a central concept of recognition primed decisions (RPD) where actions are formed from matching the current situation to a past experience. Thus, action is heavily context-specific and individualistic (Lipshitz *et al.*, 2001). The use of such knowledge in non-routine settings allows a rapid engagement and a way of moving through options by scanning for deviations and adjusting for these. RPD involve people using a recollected model of a situation which is used to explain how it arose and what will happen. When practitioners meet a new situation then they rapidly find a situation from their experience which they use to model the situation. They make this model fit by modifying it to deal with negative consequences or find a different model. Thus practitioners focus on the contextual factors of the situation to assess which of their models to use. It is this array of models that experts possess which allows them to always perform rapidly and more often successfully. Novices do not have such a resource and so must systematically work through their semantic knowledge to create a rational model, which is enervating and alien to them, making their approach slow, not smooth and lacking confidence (Dreyfus *et al.*, 1986).

NDM, and these practice-based-views of knowledge, bring out a set of explanatory concepts which allow discussion of practice activity. Some of these concepts like intuition (Klein, 2003) are contested as they appear mystical, not yielding to reductive analysis, but they bridge the explanatory gap (Levine, 1983) between thinking and action. Other explanatory concepts (situation awareness, sensemaking, analogical thinking and dialogue) provide a description of social place, response to the unfamiliar, surfacing of action and social interaction. These operate together and continuously but can be collected around a compositional view of thinking and action where action is crafted in interaction between the subject and situation. The compositional view is supported by new theories of memory (Fernyhough, 2012) where memories are reconstructed every time they are considered. A distinction is drawn between semantic memory which relates to identifiable things and naming events, and to episodic memory which relates to the overall flow of events often demonstrated by stories. People reconstruct memories using language as Fernyhough (2012, p. 75) states, 'As soon as you can use words to describe experience, you begin to have an entirely new way of encoding, organizing and retrieving information about the past.' People act in ways using their memory which demonstrate contextual purpose, thus Fernyhough (2012, p. 74), states memory 'goes beyond nuts and bolts of information storage and centres on some big questions about language, identity and consciousness'.

Both intuition (Klein, 2003) and situational awareness (Endsley, 1997) refer to the rapid appreciation of a situation involving multiple sensory inputs

from a situation but without explicit comprehension. Intuition relates to the individual feeling whereas situational awareness relates to the meaning of the social context. Intuition is often demonstrated when people state that something 'does not look right' or 'it does not add up'. Dreyfus makes the distinction between intuitive, deliberative and calculative thinking (Dreyfus, 1997) which is useful for differentiating different aspects of practice. Only calculative practice has the causality inherent in the objectivist view which sees action resulting from remembered propositions and rules. Situational awareness (Endsley, 1997) of individuals is the ability to perceive what is important in a situation immediately. This perception is interactive in that the individual pre-understands their role and what is expected to be done in the social situation. Individuals use situation cues actively, where the multiple inputs stimulate awareness, as well as being directed by the absence of expected inputs. In retrospect it is possible to lay these cues out to provide an explanation but it is the speed and non-deliberative attention that are the key aspects of this in practice.

Sensemaking (Weick, 2001) emphasizes the active nature of practice that is one of continual observation and inquiry where people are trying to understand a situation by fitting these into their available experience. It is often the case that an individual's observation and the subsequent response to their actions do not fit their past experience, at which point, there is a need for them to make sense of this. Weick's (2001) analysis of sensemaking involves *identity* where one's role determines what one is seeking, *retrospection* where the past frames determine what one can see in a situation, from which *cues* are searched for, to align the present to the past and the *social* environment so that the plausibility of an understanding in a social situation drives what can be seen. Indeed, Weick (2001) demonstrates that *plausibility* is always preferred to accuracy in a practice situation; however, this is *ongoing* in that as interactions take place and the understanding is *enacted* then the results change the sense that is being made.

Analogical thinking involves creating action through changing past experiences to be appropriate for the current situation. Analogy involves using something which is not the item to describe an item. Gentner *et al.* (2001) argue that analogies are how humans deal with novel situations and problems, and postulate that this might be the core of our cognition. Klein (1998) sees the ability to use analogues as a source of expert power and details examples of their use in practice. His argument rests on work by Lakoff and Johnson (1980) on metaphors and practical studies by Weitzenfeld (1984). Other authors (e.g. Visser, 1996; Ball *et al.*, 2004) see analogical reasoning as the basis of design of products and in engineering. Gamboa (2008) considers the wider philosophical position of this defending it against criticism. Jacobs *et al.* (2006) both provide a summary of the background to analogical reasoning and promote its explanation for effective strategy. Tsoukas (1994) places this on firm organizational ground. Thus, there is a weight of support for analogical thinking as an appropriate way of explaining what happens in practice when people meet new situations.

Dialogue is the mechanism that connects these individual actions to the social situation. In dialogue, ideas are generated by the individuals from the current themes set jointly (Shotter, 2010) where the connection can be lateral (de Bono, 1992) or metaphorical (Ortony, 1979). This shift in ideas is made within the context of the dialogue and has significance to the participants as they are there at the instance it was articulated and so understand it in its dialogical context. Articulation of an idea is a special codification, as words on the one hand can never express the connected richness of ideas but on the other hand add extra connection due to the associations of the words (Finnegan, 2002) and the needs for language structure. Thus, there is both an extended theme in a dialogue which is part of a sequence of themes and also a specific idea being articulated at any instant. During the dialogue, ideas are volatile and may disappear without trace or they can evolve into a theme to be referred to later. In this way, dialogue enables people to learn from one another where it is possible to generate useful knowledge for the parties through a process Bartel and Garud (2005) call adaptive abduction. Abduction is a term attributed to the pragmatist philosopher Pierce (1839–1914) for a form of inference from a situation that gives the best possible explanation. As Josephson and Josephson (1994) state, abduction can be used to explain problem solving, diagnosis in practice and even the real operation of objectivist science where new views and actions arise from interaction. Thus, people work in practice in a sphere of belief which they use to explain what is happening and what they should do about it in the context in which they find themselves. As Bartel and Garud (2005, p. 328) state:

> narratives offer a contextualised holistic account of events and … the onus for generalisation from such narratives lies with the person who wants to learn from the narrative. … Learning resides in the interactions.

Having these explanatory concepts allows a deeper deliberation on activities in practice as well as providing sites for activities to improve practice. One of the key methods of accessing these explanations of practice is through narratives (Czarniawska-Joerges, 2004). It is the story and context behind the narrative that is important and this research used the narrative

**Table 1** A comparison of the assumptions behind objectivist and practice-based knowledge

| Purpose | Objectivist knowledge<br>Deduction for certainty | Practice-based knowledge<br>Abduction for likelihood or best explanation |
|---|---|---|
| Elements of knowledge work | Thinking<br>Ideas<br>Concepts<br>Theories<br>Propositions | Acting<br>Events<br>Narratives<br>Emotions and feelings<br>Actions |
| Learning methods | Individual<br>Enquiry by<br>Questions/answers re: concepts<br>Analysis and synthesis<br>Identification of objects<br>De-contextualization | Social context<br>Dialogue with<br>Empathetic divining<br>Story telling/sharing<br>Observation as engagement |
| Practical application | Communications<br>Codified stores of knowledge<br>Searching for rules in database<br>Learning rules<br>Applying rules in practice<br>Feeding back new rules | Communications<br>Social relating of events<br>Situation awareness<br>Intuition<br>Sensemaking<br>Analogical thinking<br>Solution composition<br>Dialogue; adaptive abduction |
| Key references | Comte and Bridges (1865)<br>Simon (1969)<br>Newell and Simon (1976)<br>Davenport and Prusak (1998)<br>Newell (1982)<br>Zack (1999)<br>Berners-Lee *et al.* (2001) | Ryle (1949)<br>Heidegger (1962)<br>Polanyi (1958)<br>Dreyfus *et al.* (1986)<br>Klein (1998)<br>Weick (2001)<br>Wenger (1998) |

approach to knowledge management in the construction industry that Boyd and Xiao (2006) call Knowledge Event Management. This emphasizes the value of the context both in knowing, and in composing action, in practice. KEM data will be used to validate the explanatory concepts in construction practice and to propose how practice can be improved. Knowledge Event Management can be seen as moving the academic focus of knowledge management away from 'the idea', i.e. thinking about practice to 'the event', i.e. acting in practice.

## Events in knowledge management practice

Events are experiential situations that punctuate practice and they are argued here as key to the practical application of knowledge management in the construction industry. Mingers (2008, p. 73) supports this, stating that 'events in the world carry information and lead to experiences that generate meaning, ideas and knowledge for individuals'. This does not mean rejecting ideas which are essential to our human understanding, communications and development but suggests placing them at the side of practice, emphasizing what it means to be and act, not just think. Table 1 summarizes the ideas that differentiate 'events as a way of knowing' from 'ideas as a way of knowing', and presents these as practice-based knowledge and objectivist knowledge respectively. This table presents these against: elements, which make up the knowledge; learning methods, in which the knowledge operates; and practical applications, which constitute the activities of the knowledge. It is evident that the purposes of these two areas of knowledge are different. Ideas, logic and rationality support deduction which seeks a certainty of action, whereas events are the starting point for abduction to determine the best outcome of action. The characteristics of objectivist knowledge will not be explained in detail as these are well presented in the literature but references are provided in the table that show an evolution from idealist thinking through information management to knowledge being embedded in fixed domain ontologies.

Events are both experienced and talked about within the social context of construction, for example,

an event could involve the consequences for a site manager being delayed on site by the actions of the client. This event is problematic which raises the issue to the consciousness of the site manager and has a ripple effect that changes their expected practice. Lyotard (1984) centred much of his philosophy around events (which he termed unpredictable happenings) which always exceed interpretation thus influencing our emotional state. Zacks and Tversky (2001) lay out the temporal and spatial significance of events and show how multiple sources of information interact to give us our perception and conception. Shipley and Zacks (2008) present a comprehensive compendium of psychological studies on events. The identification of events is a key human activity; as Shipley and Zacks (2008) state: 'Events are the basis of all experience, so understanding how humans perceive, represent, and act on them will have a significant impact'. Many have explored philosophically how people structure events, indeed whether events are concrete, giving them a similarity to objects, or merely viewpoints; clearly events are thick in philosophical terms not yielding to a single type of entity (Shipley and Zacks, 2008). Our perception of events places a notion of causality in them, namely that one sub-event produces another sub-event. Events are therefore the site of unconscious knowledge management but provide a potential site for proactive knowledge management in the sense that they are sources of knowledge and are useful for knowledge transmission through an organization. Of fundamental importance to this paper is the fact that when individuals lack knowledge to undertake a task then they experience an event. It is not the capture and storage of knowledge which is a major significance in our study (unlike in conventional knowledge management) but how and when people need knowledge in practice.

The contributions to Shipley and Zacks' (2008) compendium give insight into the way people experience and know about events. What researchers can know about events, from the practitioners' perspective, is limited to what practitioners can tell them. The idea that practitioners' knowledge can be placed into words is commonly believed and is embedded in conventional KM. In conventional KM words then become the communication and repository of knowledge and what is presented as providing improved practice. In practice, though, this is problematic as all practices have many actions which do not involve words. However, words can be used to investigate practice tangentially, taking into account the fact that when practitioners are asked to describe their practice, they give it a logic and causality not necessarily present in the practice (Shotter, 1993). There is also a difference between written and spoken language (Finnegan, 2002) as writing formalizes language in order to standardize meaning. The formalization exhibits social conventions and time is required to create this structure. Writing is not just spoken words written out. Speaking is generally more fluid and involves immediacy particularly in social situations; it is then part of the situation and in alignment with the reconstruction view of memory (Fernyhough, 2012). It produces meaning within a situation through dialogue. The situation between people also has multiple modes of communication that are not just codified into the words (Finnegan, 2002). In gleaning knowledge from events, there is an advantage in using the spoken word. As Styhre *et al.* (2006) demonstrate in construction sites, there is a considerable amount of oral communication in construction; thus, as a method of knowledge elicitation, this has advantages for both its acceptability and its access to insights. This is enacted in two ways in KEM: audio recording and dialogical debriefing (Boyd *et al.*, 2004).

KEM uses audio recording to collect examples of events in construction (Boyd and Xiao, 2006). This allows participants to populate their speech with the emotion that they had recently experienced in the event. People, particularly construction people, are more expressive orally allowing nuances to be presented without the formal framing of writing. Indeed, speech does not need to be logically articulate to convey deep meaning in situations because of empathy in dialogue. These events are particularly sensitive, i.e. they surface explicitly to the senses. In that sense they are 'ripe' for learning about action. They are also ripe for a point where improvement can take place. This paper is concerned with making explicit the connection between what people think and do in practice. The value of the problem event is that people are forced (naturally) to think about it and connect to their actions because problems are perplexing. KEM explores these events using dialogue (Shotter, 2010) in a debriefing by researchers or by fellow practitioners to deliberate on the point at which participants deal with problems (or opportunities) in their events. What researchers are doing is enabling the participants to articulate this. This is not value neutral in the sense that researchers are part of the debriefing situation but the outcome shows the significance of practice. Crandall, Klein *et al.* (1998) have undertaken a similar task to present their understanding of naturalistic decision making through what they call cognitive task analysis (CTA).

## Demonstrating practice

KEM was developed and tested in a UK Department of Trade and Industry funded project involving two universities, 12 construction companies and two construction networks (Boyd *et al.*, 2004). The project

was concerned with 340 practitioner events and 110 debriefings and revealed a great deal of rich information useful to practice about the real operation of projects and the complex decision making that managers have to undertake (Boyd and Xiao, 2006). These rich data are used here to demonstrate the viability of the practice view of knowledge by identifying examples from practice of the explanatory concepts. The complexity of situations means that most events can demonstrate a number of forms of practice knowledge.

Situation awareness is identified in practice by the breadth of appreciation of complex physical, organizational and social contexts. A site manager working on the extension to a distribution warehouse, although a simple building, has to fully appreciate the complexity of the situation.

> when you go to a live environment with a client, you try to be as unobtrusive as you can. That is a very important part of it. But there are certain things that you just can't do without cooperation from the client. Then it is the same thing that happens at the end of working nights, getting in and doing things. You have to work around the general public and it is horrendous public safety. There are certain elements of work you can't do without having to work alongside or by a small fence between you and the general public. (Interviewee 1)

When things go wrong then situation awareness is very apparent and leads to rapid sensemaking through intuitive action. Following a flooding on site, a site manager relates:

> Monday morning and you have new trades starting that day and there are puddles of water around the work. So you've got the floor layers there that day and they can't work and there will be an aborted cost. I have to pass it on to the plumber, unfortunately, because someone has to pay for it. I pass it on to the plumber and argue. That is when things start to end. (Interviewee 2)

On another site, following a break-in and theft of cast iron shower drainage channel covers (with an eight-week delivery time), the site manager again appreciates technical, organizational and social issues on site. The immediate response showed situation awareness, sensemaking and intuition.

> So it was a shock to me that the stealing of them meant it cost a lot of money in insurance, but it altered the progress of the job. It complicated things to happen. So we've still got those trades, those operations to go on. We just had to work around it. … On top of this, I have to report to the police and my company and do a lot of paper work for the insurance claim. (Interviewee 3)

A rapid appraisal gave a satisficing solution:

> I think the solution is to fix the partition to the sub-floor, leaving the screed out until the channels arrive but allowing the partitioning, tiling and most of the pipe work to complete. (Interviewee 3)

Solutions arise to problematic events out of analogical thinking, which uses a comparative experience to generate a solution. In a major regeneration development, a significant problem of a bridge landing on someone else's land was discovered late in the project. A project manager showed analogical thinking, first about behaviour and second about practice.

> I think what I've learned is, as I've sort of, you know, gone through my career, I suppose, is you can't, when it is something like that, you can't panic, you've got to, first of all you've got to drill down and understand exactly what the problem is, and how, you know, what the issues are, and then once you've defined what that problem is, you've got to understand why it came about in the first place. … And then you've got to talk to people and say, look guys, we've got a problem, be upfront with the client and say there has been a slight, but not paint it in a negative way, paint it in a positive, pro-active, like how we're going to get through it sort of way. (Interviewee 4)

> I held a meeting, so I got the design people along, I got the transport consultant, the engineer along, and the architect, and we basically, in that meeting, we redesigned the footway. And then I went to the Land Registry Office and got some Land Registry drawings, so then overlaid that on the drawing that we had for the structure, for the alignment, so we can work out exactly where the land boundary crossed. We then changed the, well this was more the engineer, but he came up with a design, so changed the footway from a concrete footway to a steel footway, which was thinner, and to take the abutments into a slightly different position where they cantilevered slightly, but basically it avoided that section of land. (Interviewee 4)

The decision making showed a great deal of complexity. It showed not only that there were multiple elements that required technical, organizational and relational awareness but also that most decisions have multiple stakeholders, multiple determinants and multiple consequences which do not allow for optimization but require appropriateness in a situation. The practitioner is aware that it is always likely that one of the stakeholders will isolate one of the problem consequences as an opportunity for criticism or as a token for negotiation. This all needed to be handled sensitively to keep everyone on his side.

Practitioners are always making sense of the situation through an intuitive engagement with the

world that then leads them into analogical thinking. So for example an electrician entering a property to be refurbished perceives a complete spatial analogue of the difficulties of the job around the way the floor joists and floorboards run, although he cannot articulate this easily as the perception is not language based:

> if the floorboard – if the joists, sorry – run from front – no, sorry – side to side, and you can get ones that you pull up in the hallway and the landing straight through the house. So you can imagine if you've got it like this, and your joists are going this way … so you can drill all the way through there. And even if you've got a wardrobe here, you can still get the wires underneath. (Interviewee 5)

However, analogues may not be successful. For example, in deciding the sequencing of construction on site, past experience was used to initially not construct all of a ground beam to leave access for plant:

> what it is, is two bits of corners of ground beams. There is an opening there already, but we left the two corners on either side to keep it wider to make it easier to get in. I had an engineer with me because I hadn't done a shed before, to be honest, I do more complex projects. He had done a lot of other sheds and he suggested it. At the time I went along with it. I wish I had probably put them up to be honest. But that is what we normally do, that is what we do. We obviously cut it. The cut came across where the corner pieces should have gone. Unfortunately the cutting was just a bit lower than the top of the ground beam so we couldn't get a clean joint. (Interviewee 1)

This demonstrates two problems: one about relying on past experience (the expected practice of conventional KM) and the other about the constructional demands of modular buildings which are designed in isolation from practical context. Practice is not ideal and work impedes other work. Therefore, it is not the finished product that is important in thinking about onsite production but the ordering of events to accomplish the finished product. There is a compromise that neither impedes production nor affects the quality of the finished product. The compromise itself is always wrong in some way and it has consequences that require managing and in this case a disturbing event that was not expected.

Returning to the stolen shower drainage channels, the site manager demonstrating emotional resilience in order to cope in his problematic world explained his solution:

> He would have built them (partitions) between the channels and off the floor, but we were conscious that this might give us a problem that we've got a big hole now where there's no floor because the channels aren't there and we were conscious that it's possible that he could be possibly putting the partition in the wrong place, building it up wrong because of these channels not being in, it could be in the wrong place. You need the channels to work to. But we got over that problem by making the chap aware where the wall had to go, we had to put pipes up so we got over that problem. It was the fact that it's not let us complete various operations. We have to make a second visit. (Interviewee 3)

There was no way that the solution articulated was found by rational analysis and coordinated planning; it was generated too quickly and not well articulated. The solution was based on past experience and the intimate familiarity with the project involving knowing what might work in the situation. It is intuition as it involves a rapid assimilation and response to multiple inputs and subtle distinctions (Klein, 1998). This event exemplifies the complexity and dynamic decision making and problem solving required in the construction site situation. The site manager not only has to deal with the immediate consequences of the theft (that is the official reporting, the communications with the subcontractors to stop them attending, investigating the theft, costing the loss and reordering the materials which included trying to negotiate an early delivery) but also re-planning the project so that progress was not too affected and that following trades were not adversely impeded. The latter could be regarded merely as a cost issue but the overall coordination of the job provides smooth flow of work, a positive social negotiation and a higher quality product. The technical problems of the order of construction had to be appreciated about what could be left out and what could be undertaken later. Impeding the flow of work to subcontractors might also increase the price if they have to return at a subsequent time to complete work out of their planned attendance. Also it runs the risk that the subcontractor is not available.

The following demonstration of dialogue shows how ideas develop. In a debriefing session with a young project manager, where the theme was about expertise in practice, the interchange came upon the idea of how people prepare themselves for an imminent event. The dialogical interchange developed a learning event in the respondent.

**Interviewer:** Do you prepare yourself to think through the situation beforehand, so that, you say, I'm going to do this, like this, or does it just happen within the circumstances?

**Respondent:** Yeah, yeah, I know, I see what you're saying. I think, there's not a blanket rule. I think that I don't always think

about it, I think that I don't always act impulsively …I find also that I'm actually different when I'm relating to somebody face to face, to when I'm speaking to them on the phone …

**Interviewer:** Right, interesting, yeah?

**Respondent:** I find it easier to understand and deal with problems when I'm speaking to somebody on the phone. Because I'm listening to what they're saying, I'm digesting it and I'm just thinking it through. When I'm there, face to face, there's all the other things to deal with …

**Interviewer:** Yeah, yes.

**Respondent:** also meetings, like, I tend to, if something is frustrating me, I tend to let myself kind of get agitated by it, or frustrated by it quicker than if it's on the phone …

**Interviewer:** You can distance yourself from it, yes. Is that something you feel you're developing, what I mean, being there, on the spot, you're developing a way of handling?

**Respondent:** … recently I've been trying to sort of train myself, almost to not do that, to actually listen to the problem and to calm myself down …

**Interviewer:** So you're aware that something's happening to you in the situation.

**Respondent:** I'm probably not quite there yet, but I'm trying to develop … (Interviewee 4)

The dialogue showed empathetic divining (Heron, 1990) in that there was a shared appreciation of the activity. The idea was developed by the respondent as they explored their situation awareness and composed action. They had intuitively realized their ineffective response in difficult situations which was making them change their practice. The ideas of 'see what you are saying', 'digesting it' and 'sort of train myself' is the vocabulary from analogical thinking in response to the debriefing and may be useful for relating this realized practice to others. The interviewer used supportive prompts but also added their own analogue 'distance yourself' which related to the respondent's position and stimulated the learning. Practice is not neutral; it is a mutually engaged activity and must be inquired into and learned from in a similar way for it to be useful.

## Discussion

The theories of practice and the demonstration of these from practice show that practice knowledge is constituted differently from objectivist knowledge; it is known differently and used differently. Most of the KM literature in construction fails to recognize this difference and promotes only the tacit to explicit conversion. This discussion will consider how a practice-based approach can be enacted (1) as part of learning to change and improve practice; (2) through using events as an opportunity for this through analogical thinking during dialogue; and (3) within the social situation of practice to provide a critical view of events for this learning and improvement of practice to take place.

### Learning to change in practice

Although the explanatory concepts of practice can be evidenced in construction, they do not in themselves provide an explanation of how practice can be improved. Indeed the logic of knowledge management, whether experiential or objectivist, would lead to a difficulty in this respect, both perspectives are backward looking (Boyd and Bentley, 2012). In practice, when improvements are sought, then enacting practice, thinking about practice, and explaining practice all have to change. In all forms of KM this involves 'learning' but this is explained very differently in different conceptual frameworks which are summarized in Table 1.

Learning in the objectivist view has aspects of behaviourism (Baum, 1994) as it sees practice as acting out of routines. Then learning to work better requires learning new routines and accessing better information (e.g. as offered by Anumba (2000) in construction). However there are also aspects of cognitivism (Sternberg and Mio, 2006) where there is a personal developmental element based in language, e.g. as offered by Carrillo (2005) in construction. In cognitivism, learning focuses on the individual as the key point of change (e.g. Newell and Simon, 1972; Kolb, 1984) although even the cognitivists extended the notion to social groupings. However, within a practice-based view, learning is socially based (Bandura, 1977). This notion of learning is also present in Lave and Wenger's (1991) work which they term situated learning, and this produced the ideas of communities of practice (Wenger, 1998). Here practice is an interactive and judgemental performance within a social setting (Cook and Brown, 1999; Mingers, 2008) and so learning means sensing the situation better (Weick, 2001) and making better, socially acknowledged, judgements (Nicolini, 2011). The notion of better is socially defined through the prevailing value systems. Thus, what can be achieved is framed by the circumstances; and so it is seldom possible just to perform a better task in isolation without there being some accommodation in the situation. The idea of learning from events which embraces the social context, as proposed in this paper, becomes essential for developing practice. This was demonstrated in the previous section in the example of dialogue where the interaction and

social situation released knowledge of the emotional preparation for meetings.

### Events as learning opportunities

Studies of real practice, as presented here and within the naturalistic decision making literature (e.g. Lipshitz *et al.*, 2001) demonstrate its contextual, compositional and ineffable aspects. This identifies 'events' as suitable situations in which to study practice and to learn from practice. This realization is particularly pertinent in construction which is a physical, project-based industry involving continual change punctuated by events.

The KEM approach, which focuses on events in construction, overcomes the methodological and operational problem of presenting and re-presenting practice knowledge and enables learning. This engages with practitioners in the way that they engage with the world. The study of 'events' is automatically of interest to practitioners as these have risen to the attention of the practitioner as shown in the last section with events of flooding, theft, and joists in unexpected places. The use of audio recording and debriefing, with a structured framework of practice cues relating to the explanatory concepts, helps practitioners to articulate the problematic meaning of the event. This overcomes the rather banal and incoherent account of practice for example in the previous section by the electrician and helps elicit the complex skill of practice. The techniques of engagement acknowledge the social aspect of learning which is provided by the dialogical technique of KEM. The cues, provided by the explanatory concepts of practice (situation awareness, intuition, sensemaking and analogical thinking), direct attention critically to the performative aspects in the event, such as shown by the project manager in relation to clients and teams, and this enables learning in practice. These explanatory concepts create a vocabulary which can articulate assumptions, determine contextual enablers and disablers, and explore wider consequences. This directs the dialogue to consider extended time, and contexts, thus displacing knowledge (Schon, 1963) for it to be useful in other situations as shown in the dialogue with the young project manager regarding his emotional conduct in meetings. The KEM process re-forms the event into a narrative embodying this learning which becomes the vehicle for transmission across the organization. People remember events in an episodic manner (Tulving, 1972; Fernyhough, 2012) and people tell the stories of the events from their experiences (Pentland, 1999; Snowden, 2002). Narratives are a growing approach to knowledge management with Snowden (2002) seeing them as a third generation of methods. Leung and Fong (2011) and Styhre (2008) are using narratives in construction to enable learning.

Using these explanatory concepts, it is possible to explain how critical dialogue works with analogical thinking (Shotter, 2010) and adaptive abduction (Bartel and Garud, 2005) to enable changed practice. Events are analogues for the future practice of doing: that is, they provide the building elements for composing practice. This can be viewed as similar to the way that ideas become the elements of logical thinking through grammatical structure. Events are used in practice through a structure of practice set within industry norms. Analogues are moulded to fit a new situation and hence move experience from one context to another including the social situation where there are different viewpoints (Jacobs *et al.*, 2006). Analogues can have many characters (e.g. spatial, social, effort, distance as suggested by Lakoff and Johnson (1980)) but they all relate to the situation as a whole which is recognized as similar in another situation. This was shown in the example of the construction project manager around behavioural and managerial aspects. Indeed it is this skill of making knowledge applicable to other situations which is key to how KEM produces learning and improvement. As analogues, recalled from past experience, are used to compose practical action, then acting better means both having different analogues and using analogues differently. This suggests that learning new analogues and learning to work better with analogues are key skills for improving practice.

## Social basis of improvement

This connection between accessing useful knowledge and using it for improvement is important for construction and this needs to take place within the social situation of practice. As people use the explanatory concepts to describe actions in, and make sense of, events with each other, they validate the concepts and train themselves in their use. The KEM approach formalizes and improves what happens naturally in practice; however embedding the approach in the organization and operations ensures that benefits are explicitly recorded and extended across the organization. Indeed the role of management can be to facilitate learning by staff by providing both space and time for activities. It is also possible to create training events that highlight the skills (situation awareness, intuition, sensemaking and analogical thinking) in problem-based activities.

There are some difficulties in the social situation of practice that need to be addressed. First, there is a massive quantity of knowledge available, and it is difficult to know what is true and 'much of our everyday knowledge is actually intersubjectively shared

knowledge about acting effectively within these social systems' (Mingers, 2008, p. 74). Thus, it is the social position of an event that determines what knowledge is considered and what success means and this is affected by power and authority. Second, there is little time for deliberation on events in construction because of project delivery pressures and so learning is reduced. Both of these require a really critical enquiry into the event narratives in order to create better analogues. This needs to overcome the social conservativeness of the situation and so this needs to be undertaken by consultants or by colleagues from a different project.

The position of objectivist knowledge also needs addressing as this cannot just be dismissed. A full discussion of this is beyond the scope of this paper. Objectivist knowledge is external to the situation of the event and so can allow people to think beyond a situation whether spatially, socially or temporally. Thus, objectivist knowledge can be used as a critical challenge in the debriefing. This provides a new meaning and use for objectivist knowledge, not as a ready-made solution, but as a critical stimulator of practice. It directs attention to particular aspects of the practice-based view because of its focal attention and so provides a suitable challenge. This challenge also directs people to consider action beyond their experiential understanding. Thus, the KEM approach can accommodate objectivist knowledge and place it within the social situation of practice but make it less imposed and so relevant to the realities of practice. Mingers (2008) supports such an approach to accommodate objectivist knowledge in a creative and socially supportive manner. He promotes a multidimensional and multivalent view of knowledge within a critical realist framework involving propositional, experiential, performative and epistemological forms each with their different access to 'truth'. This has similarities to de Bono's idea of the six thinking hats (de Bono, 2009) where people in interaction adopt contrary positions to generate successful action in social situations. As Jacobs *et al.* (2006, p. 6) state,

> cognitive sculpting, serious play and analogically mediated inquiry appear to exemplify the performative aspects of practice, to the extent that objects and movements are involved precisely for the reason that they provide experience and carry significance for which language alone is inadequate.

In this way people do learn from practice and knowledge management can positively change organizations.

## Conclusion

Deliberating on events in construction can bridge the gap between thinking about practice and doing practice. Knowing in practice is not adequately represented by thinking about practice as it involves a reduced and idealized representation of practice. Conventional KM has been based on thinking about practice, thus it does not address the full problem of practice. Practice is complex as it cannot be articulated, it is emotional with personal pressures and it is social demonstrating opportunities and threats. Practice is also path dependent with outcomes being determined by the order and outcomes of previous steps. Practice can be accessed and re-presented by studying events, which are sensitive points of experience, through dialogue. Explanatory concepts of practice were used to show from studies of events how people act interactively with the situation in construction to compose solutions rather than use learnt rules. Learning from events requires creating new analogues by using adaptive abduction in critical dialogue. This learning can be embedded in revised narratives which can be transferred socially through the organization. When improvements are sought, change needs to take place in practice, thoughts on practice and explanations of practice. Improvement then cannot be the learning of successful propositions but must be the learning to act better in situations. Organizational improvement then takes place through individuals working collectively both through seeing the consequences of action and from sharing their narratives of events in a critical manner and this can be facilitated and encouraged by active management. Objectivist knowledge is not discounted in this approach but is re-valued appropriately as part of the critique of events.

The research has limitations because of the difficulties that practitioners have in articulating their practice. This requires many more studies of practice involving in-depth dialogue with practitioners. In addition, the use of the changed analogues was not well evidenced and further research is necessary that follows the transference of narratives through an organization. The challenge required in practice to create changed analogues also needs further investigation. This is important as there are real opportunities of working with others on new analogues using dialogue. The suggestion for the new use of objectivist knowledge for critical dialogue is novel but further research is required on this use against its conventional use. The study did not investigate how practitioners could develop further the skills of situation awareness, intuition, sensemaking and analogical thinking but this may be a role for formal education.

The adoption of a practice-based approach is an important development for construction because construction practice takes place in the physical and social world thus involving multiple views with different thinking because of its many stakeholders and its

fragmented system for delivering buildings. There are tremendous opportunities to help construction to improve from within organizations and projects using a practice-based approach; this ensures improvements are viable and supported with commitment. As well as finding changed analogues, dialogue enables better social coping in a problematic world and a shared meaning for improvement to be negotiated. In addition, the practice-based approach identifies the complexity of construction practice which can be used to celebrate the skills of practitioners both to validate these and to attract and develop new entrants.

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